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ENHANCING BRAND EQUITY THROUGH FLOW: COMPARISON OF 2D VERSUS 3D VIRTUAL WORLD

Completed Research Paper

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Abstract

This research uses the theory of flow to examine the effect of 2D versus 3D virtual world environments on brand equity and use intention. The results suggest that a 3D virtual world environment has both positive (indirect) and negative (direct) effects on brand equity. The positive, indirect effect of the 3D virtual world environment occurs through feelings of telepresence and enjoyment, both of which contribute positively to brand equity and, in turn, induces a higher behavioral intention. The negative, direct effect can be explained using distraction-conflict theory, where attentional conflict is faced by users of a highly interactive and rich medium. This paper explains the flow experience and its effects on brand equity in 2D versus 3D virtual world environments, and provides insights to practitioners for designing 3D virtual world sites to enhance brand equity and behavioral intention.

Keywords: virtual world, flow, telepresence, enjoyment, brand equity, use intention

Introduction

The potential of 3D virtual worlds (3DVWs) as a commercial and marketing tool is extremely attractive and compelling (Brandon 2007). Earmarking the next development in the Internet, 3DVWs are providing significant potential for enhancing customers' perceptions of a business and its brand. Companies that have created a presence in 3DVWs include Adidas, Sony, Reuters, Cisco Systems, IBM, Dell, Sun Microsystems, and Warner Brothers.

3DVWs are not only characterized by 3D space in a computer-generated environment, but they are also augmented with capabilities of real-time communication and interactivity with objects in the 3D space (Davis et al. 2009; Park et al. 2008). Users experience the 3DVWs through their avatars, which are digital representations of themselves, by interacting with objects and other avatars in the environment. The capabilities of 3DVWs can far exceed those of the 2D environment by offering a greater sense of telepresence and engagement (Hoffman and Novak 1996; Park et al. 2008). Customers who enjoy their online experience with a brand may develop a greater sense of association and interest in the brand, and patronize the brand over its competitors in the real world (Drenger et al. 2008; Park et al. 2008; Taylor et al. 2007).

Hence, two related questions of interest are: Are the 3DVWs more capable of engaging customers and providing positive experiences to customers than the 2D environment? If so, can 3DVWs and the experiences they offer to customers be helpful for enhancing their perceptions of the value of the brand as well as their intentions to use the products or services associated with the brand? Our research focuses on answering these two questions.

Background and Literature Review

3DVWs are attracting a tremendous amount of attention from the business community. Some businesses have created a presence in 3DVWs because they see significant potential and opportunities with the exponentially increasing population in these environments (Arakji and Lang 2007). Ives and Junglas (2008) predict that by 2018, virtual worlds will be a major, if not dominant, platform for business applications and opportunities. Barnes (2007) suggests that 3DVWs are designed to entertain as well as create experiences that engage both existing and potential customers of businesses. Such experiences can in turn enhance customers' perceived value of a brand (Park et al. 2008).

3D Virtual Worlds and Flow

3DVWs can be used to create a rich and immersive environment to maximize customers' experiences. More specifically, businesses can capitalize on the hedonic capabilities of 3DVWs to create such experiences. The immersive environment afforded by 3DVWs allows users to experience a high level of interactivity and presence in the environment (Hecht and Reiner 2007; Lok 2004; Mikropoulos and Strouboulis 2004; Riva et al. 2007). By participating in online activities that are closer to experiencing the products and services, customers' beliefs, attitudes, and behaviors towards these products and services can be enhanced (Klein 2003). In other words, businesses can use 3DVWs to engage customers in a state of flow when participating in online activities to learn about products or services offered, which in turn enhance brand equity beyond what the 2D environment can provide (Park et al. 2008).

Brand Equity and Flow

A brand is a "name, term, sign, design, or a unifying combination of them intended to identify and distinguish a product or service from its competitors" (McDowell and Sutherland 2000). Brand equity is defined as "a set of brand assets and liabilities linked to a brand, its name and symbol that add to or subtract from the value provided by a product or service to a firm and/or to that firm's customers" (Aaker 1991, p. 15). Brand equity also refers to the value added to a product via its brand name (Yoo, Donthu, and Lee 2000). Brand equity is an important consideration for businesses, and has been cited as one of the most important assets and a company's key performance metric (Capps 2007; Samli and Fevrier 2008; Taylor et al. 2007).

The benefits of brand equity are numerous, and they include: enhancing customer loyalty and the likelihood of brand choice, attracting new customers, developing sustainable competitive advantages, increasing the willingness of consumers to pay premium prices, increasing brand name extension capabilities, and greater resiliency to marketing actions by competitors (McDowell and Sutherland 2000; Yoo, Donthu, and Lee 2000). Since Drenger et al. (2008)

have examined the influence of flow and positive emotions on brand image (which is an important component of brand equity), it is not clear if such a relationship holds in an online context. Therefore, research that compares online hedonic experience and its impact on brand equity in the 3DVW versus 2D environment can provide businesses with insights on the effectiveness of these environments for enhancing brand equity.

3D Virtual Worlds and Marketing

The high degree of engagement that one can potentially experience in 3DVWs coupled with the richness of the environment provide businesses with ample opportunities to carry out marketing and commerce. Branding sites developed in 3DVWs should not simply resemble traditional advertising campaigns, they need to fully capitalize on the rich and highly interactive features of the 3DVW environment to engage and involve customers (Leggatt 2007). The co-existence of virtual reality, imagination, and innovation allows for extended business applications in 3DVWs including visiting a 3D model home and experiencing it virtually, testing a newly designed product before being manufactured, and creating social-shopping experiences (Kim et al. 2008; LaMonica 2007; Lui et al. 2007). In a pilot study, Barnes and Mattsson (2008) found that a presence in virtual worlds, such as Second Life, can influence perceptions of brand value (i.e., dimensions of emotional, logical, and practical value), in both positive and negative ways. Arakji and Lang (2008) propose a theoretical framework, called Avatar Business Value Analysis, to facilitate the assessment of business value, which includes brand awareness and revenues, in virtual world environments. One key factor that is identified as necessary for successful virtual world commerce is realizing that 3DVWs are “more than just another marketing channel for real world products” (Arakji and Lang, 2008, p. 215). Hence, research that explores the unique experiences inherent in 3DVWs is needed. Given the growing importance, popularity, and potential of businesses to create sites in 3DVWs, companies are looking into using 3DVWs to create a much richer environment than traditional media for engaging customers in business activities, enhancing their online experiences, promoting brand equity, and enticing them to return to the physical or virtual business site for repeat purchases.

Theoretical Foundation and Hypotheses

The focus of this research is to understand the effects of 2D versus 3DVW on brand equity and use intention. We draw on two theories to generate the hypotheses and model for this research: theory of flow by Csikszentmihalyi (1975, 1991, 1993, 1998) and brand equity theory by Keller (1993).

Theory of Flow or Optimal Experience

Flow has been defined as an optimal state of experience in which one is completely absorbed and engaged in an activity that nothing else seems to matter (Csikszentmihalyi 1975, 1991, 1993, 1998). It is a state of consciousness that is experienced by people who are deeply involved in an activity. The flow experience is characterized by some common elements (Csikszentmihalyi 1975, 1991, 1993): Clear goals and immediate feedback, challenges of an activity and skills required to meet those challenges, concentration on the task at hand, sense of control, merging of action and awareness, loss of self-consciousness, distorted sense of time, and self-rewarding or autotelic experience. The theory of flow has been suggested to provide a relevant framework to understand factors that influence one's experience when utilizing technology (Ghani and Deshpande 1994). Table 1 summarizes previous empirical studies on application of flow theory in online environments.

Table 1. Summary of Literature on Flow Theory in Online Environments					
Reference	Flow Antecedents	Flow Experience	Flow Outcomes	Research Setting	Method
Ghani et al. (1991)	Skills, Control, Challenge	Enjoyment, Concentration		Virtual versus face-to-face groups	Survey
Trevino & Webster (1992)	Technology Type, Tech Char. (Ease of Use), Ind. Diff. (Computer Skill), Organizational Factors (Management Support, Partners' Medium Use)	Control, Attention Focus, Curiosity, Intrinsic Interest	Attitude, Effectiveness, Quantity, Barrier Reduction	Communication Technologies (E-mail, Voice Mail) in Work Setting	Survey

Webster et al. (1993)		Control, Attention Focus, Cognitive Enjoyment (Curiosity and Intrinsic Interest)	User Control, Attention, Positive Attitude, System Use, Positive Work Outcome	Software Usage in the Work Setting	Survey
Ghani & Deshpande (1994)	Control, Challenge	Enjoyment, Concentration	Exploratory Use	Computer Use	Survey
Ghani (1995)	Task Challenges and Perceived Control, Cognitive Spontaneity	Enjoyment, Concentration	Focus on Process, Learning, Creativity	Work Communication	Survey
Hoffman & Novak (1996)	Content Characteristics (Skills, Challenges), Content Characteristics (Interactivity, Vividness), Process Characteristics (Goal-Directed, Experiential, Involvement, Focused Attention, Telepresence)	Flow	Consumer Learning, Perceived Behavioral Control, Exploratory Behavior, Subjective Experience (Pleasure, Future Voluntary Computer Interaction, and Time Distortion)	Hypermedia Computer Mediated Environment	Conceptual
Lombard & Ditton (1997)	Vividness (through type and various sensory outputs), Interactivity, Contents, Media User Variables	Presence (or Telepresence)	Arousal, Enjoyment, Involvement, Task Performance, Skills Training, Desensitization, Persuasion, Memory, Social Judgment, Parasocial Interaction, Relationship	Virtual Environment	Conceptual
Nel et al. (1999)		Content, Attention Focus, Curiosity, Intrinsic Interest	Website Re-visit	Web Navigation	Experiment
Agarwal & Karahanna (2000)	Personal Innovativeness, Playfulness	Cognitive Absorption (Curiosity, Control, Temporal Dissociation, Focused Immersion, Heightened Enjoyment)	Perceived Ease of Use, Perceived Usefulness, Intention to Use	World Wide Web	Survey
Chen et al. (2000)	Clear Goals, Immediate Feedback, Potential Control, Merger of Action and Awareness	Concentration, Time Distortion, Loss of Self Consciousness, Telepresence	Autotelic Experience, Positive Affect	Web Navigation	Survey using online ESM (Experience Sampling Method)
Novak et al. (2000)	Skill/Control, Interactive Speed, Importance, Challenge/Arousal, Focused Attention, Telepresence/Time Distortion	Flow	Positive Affect, Exploratory Behavior	Web Navigation	Survey
Rettie (2001)	Goals, Feedback, Skills, Challenge	Merging of Action and Awareness, Focused Concentration, Sense of Control, Loss of Self-Consciousness, Time Distortion, Autotelic Experience		Internet Use	Focused groups
Koufaris (2002)	Product Involvement, Web Skills, Value-	Shopping Enjoyment, Concentration	Intention to Return	Online Shopping	Survey

Added Search Mechanism, Challenge					
Luna et al. (2002)	Balance – Challenges/Skills, Perceived Control, Unambiguous Demands, Focused Attention, Attitude toward Site	Flow	Revisit Intention, Purchase Intention	Websites	Experiment
Huang (2003)	Complexity, Novelty, Interactivity	Control, Attention, Curiosity, Interest	Utilitarian Performance, Hedonic Performance	Website	Survey
Klein (2003)	Media Richness, User Control	Telepresence	Persuasion, Attitude Belief Strength, Attitude Intensity	Computer-mediated Environment	Experiment
Korzaan (2003)		Flow	Exploratory Behavior, Attitude	Online Shopping	Survey
Luna et al. (2003)	Attention, Challenge, Interactivity, Attitude towards the Site	Flow	Purchase Intent, Revisit Intent	Website	Survey
Novak et al. (2003)	Goal-directed vs. Experiential Activities, Skill, Challenge, Novelty, Importance	Flow		Online Shopping Experience	Survey
Hsu & Lu (2004)	Perceived Ease of Use	Flow	Attitude, Intention	Online Game	Survey
Jiang & Benbasat (2004)	Visual Control, Functional Control	Flow		Shopping Websites	Experiment
Pace (2004)	Goals and Navigation Behavior, Challenge and Skills, Attention	Duration, Frequency and Intensity, Joy of Discovery, Reduced Awareness of Irrelevant Factors, Distorted Sense of Time, Merging of Action and Awareness, Sense of Control, Mental Alertness, Telepresence		Web Browsing	Grounded Theory (Theoretical Sampling, Semi-Structured Interview)
Pilke (2004)	Immediate Feedback, Clear Rules/Goals, Complexity, Dynamic Challenges			World Wide Web	Interviews
Reid (2004)	Cognitive Ability, Volitional Control, Self-Efficacy	Flow and Playfulness	Competence, Creativity, User Satisfaction	Virtual Reality	Interviews, Experiment, Observation
Skadberg & Kimmel (2004)	Speed, Ease of Use, Attractiveness, Interactivity, Domain Knowledge/Skill, Information on the Web Site/Challenge	Enjoyment, Time Distortion, Telepresence	Increased Learning, and Subsequent Attitude Change and Behavior Change	Web Browsing	Survey
Fortin & Dholakia (2005)	1 st Level: Interactivity, Vividness 2 nd Level: Involvement, Social Presence	Arousal	Attitude towards Ad, Attitude towards Brand, Purchase Intention	Product Website	Experiment and Survey

Siekype (2005)		Challenges, Concentration, Curiosity, Control	Intention to Purchase, Intention to Return	Website	Survey
Chen (2006)	Clear Goal, Potential Control, Immediate Feedback, Merger of Action and Awareness	Telepresence, Time Distortion, Concentration, Loss of Self-Consciousness	Positivity of Affects, Enjoyable Feeling	Web Browsing	Digitalized Experience Sampling Method
Li & Browne (2006)	Need for Cognition, Mood	Focused Attention, Control, Curiosity, Temporal Dissociation		General Online Experience	Survey
Shin (2006)	Skill, Challenge, Individual Differences	Enjoyment, Telepresence, Focused Attention, Engagement, Time Distortion	Achievement, Satisfaction	Virtual Learning Environment	Survey
Tung et al. (2006)	Involvement	Flow	Mood, Attitudes	Websites	Survey
Chang & Wang (2008)	Interactivity, Perceived Ease of Use	Flow	Perceived Usefulness, Attitude towards Use, Behavioral Intention	Online Communication Tools	Survey
Park et al. (2008)	Content Characteristics (Skills, Challenges), Content Characteristics (Interactivity, Vividness), Process Characteristics (Extrinsic Motivation, Intrinsic Motivation)	Flow	Brand Equity	3D Virtual World	Conceptual
Guo & Poole (2009)	Website Complexity, Clear Goal, Immediate Feedback, Congruence of Challenge and Skill	Concentration, Control, Mergence of Action and Awareness, Transformation of Time, Transcendence of Self, Autotelic Experience		Websites	Experiment
Lee & Chen (2010)		Concentration, Enjoyment, Time Distortion, Telepresence	Attitude, Intention, Self-efficacy, Controllability, Perceived ease of use	Online Purchase	Survey
Nah et al. (2010)		Flow	Brand Equity	3D Virtual World	Survey

As presented in Table 1, researchers have developed different models for explaining the online flow phenomenon and the degree of variations across these models is relatively high. There is no consensus in the literature as to which factors constitute antecedents, dimensions, and outcomes of flow. Therefore, additional studies are needed to enhance our understanding of the flow experience especially with emerging technologies such as 3D virtual world environments which may provide a different degree of flow experience for users. In this paper, we adapt Skadberg and Kimmel's (2004) recommendation to conceptualize flow using three dimensions that appear to be most relevant to studies of 3D virtual world experiences: telepresence, time distortion, and enjoyment. Skadberg and Kimmel found telepresence to be an important characteristic of flow and provided evidence and justification for the use of telepresence, time distortion, and enjoyment as the measurement variables of flow in the context of human-computer interaction. Skadberg and Kimmel (2004) also characterized the state of telepresence to be synonymous to the characteristics of flow, such as focused attention/immersion/concentration. Chen (2006) found telepresence, time distortion, and concentration to load together to represent the flow experience. Hence, in this research, we will follow Skadberg and Kimmel's (2004) recommendation to operationalize flow as telepresence, time distortion, and enjoyment and assess their potential overlap with focused attention/immersion/concentration.

Telepresence is the “mediated perception of an environment” (Steuer 1992, p. 6). As noted by Suh and Lee (2005) citing Biocca (1997), “human beings can create a perceptual illusion of being present and highly engaged in a mediated environment, while they are in reality physically present in another place” (p. 675). This illusion is termed telepresence. Telepresence is highly relevant to this research because it is media-induced (i.e., in line with the IT artifact in this research, which is 2D versus 3DVW).

Time distortion or temporal dissociation refers to “inability to register the passage of time” (Csikszentmihalyi and Csikszentmihalyi, 1988, p. 33). This factor has been cited as one of the relevant elements of the flow experience (Csikszentmihalyi 1991). In the context of 3DVW environments, the engaging nature of the environment that more closely resembles one’s natural surroundings could lead to an individual focusing more on the virtual environment than their real environment. Therefore, an individual may lose sense of real-world or physical time or experience time distortion.

Enjoyment, or autotelic experience, refers to an intrinsically rewarding experience (Guo and Poole 2009). Enjoyment has been highlighted as a key factor in the flow experience, especially in human-computer interaction studies (Ghani and Deshpande 1994). This factor has relevance to the 3DVW environment considering the nature of the activities that one’s avatar can engage in. For example, avatars can fly or dance. Therefore, incorporating this hedonic experience, enjoyment, is relevant for this study.

Another key factor that has been cited as relevant to the flow experience is focused attention/immersion/concentration (Ghani and Deshpande 1994, Skadberg and Kimmel 2004). Kim and Biocca (1997) and Suh and Lee (2005) suggest that users will be engaged in a virtual environment when they experience telepresence. In other words, when users perceive telepresence, they will become so focused on the virtual or mediated environment to the extent that their stimulus field is limited to just that environment, and the physical environment is being ignored. Considering the engaging nature of a 3DVW environment, focused attention/immersion/concentration may be a key dimension for studying flow in these environments and, hence, is included in this study.

Media Effect of 2D versus 3DVW

Users in a 3DVW environment are able to interact directly with 3D objects in the virtual space and navigate in a spatial 3D environment, thus experiencing a higher sense of interactivity and vividness. Steuer (1992) defines interactivity as “the extent to which users can participate in modifying the form and content of a mediated environment in real time” and vividness as “the representational richness of a mediated environment.” The 3DVW environment offers a greater number of sensory inputs and outputs than in a 2D environment. Park et al. (2008) identify a list of affordances in the 3DVWs, such as haptic (i.e., sense of contact or touch) feedback and sounds that simulate real sensations, that contribute to enhanced interactivity and vividness. Hoffman and Novak (1996) and Park et al. (2008) argue that higher levels of interactivity and vividness will increase users’ flow experiences.

In particular, the sensory richness and spatial components of 3DVWs can trigger higher levels of telepresence and give rise to a more intrinsically rewarding experience, thus leading to a higher level of flow state (Coyle and Thorson 2001; Hoffman and Novak 1996; Park et al. 2008; Steuer 1992; Trevino and Webster 1992).

H1: The 3D virtual world environment affords a higher level of flow state than the 2D virtual environment.

Theory of Brand Equity

Brand equity theory proposes that consumers prefer to be associated with products and services of organizations with a strong brand (Allen et al. 2007 citing Keller 1993). Brand associations, which make up the brand image and perceived value, can vary by favorability, strength, and their uniqueness (Keller 1993). These dimensions, as a whole, determine consumers’ differential response and brand choice. Since customer-based brand equity, which is the focus in this research, refers to customers’ perceived value of a brand beyond its functional value (Keller, 1998), it can also be conceptualized as the added value of a brand to a customer (Aaker, 1991). Brand equity is an important concept because of its ability to influence attitudes and behaviors (Allen et al. 2007; Keller 1998) and attract customers for (repeat) visits and purchases (Mummalaneni 2005).

Drenger et al. (2008) found that flow can influence brand image through positive emotions. Although Drenger et al.’s operationalization of flow does not include enjoyment or autotelic experience whereas Csikszentmihalyi (1975, 1991, 1993, 1998) regards it as a characteristic of flow, we argue that enjoyment from the flow experience can

increase consumers' learning and knowledge of a brand, which enhances brand equity. Other researchers have also demonstrated positive outcomes of the flow experience in terms of increased learning and attitude change (Hsu and Lu 2004; Klein 2003; Shin 2006; Skadberg and Kimmel 2004; Trevino and Webster 1992; Webster 1993), both of which can contribute to higher brand equity.

H2: Flow has a positive impact on brand equity.

Media Effect of 2D versus 3DVW

The 2D versus 3DVW environments use different ways of communication such as in the mode of information presented and the way in which information is received (Croteau and Hoynes 2000). When compared to the 2D environment, the higher interactivity and richer medium in the 3DVW environment has the potential to afford a more enriching experience for customers in online branding activities independent of any flow experience that may emerge from the interaction. In 3DVWs, individuals may gain a richer understanding of products or services from the 3DVW experience beyond what flow experiences may contribute, thus enhancing brand equity.

Similarly, Li et al. (2002) demonstrated that 3D advertising can improve an individual's knowledge of a product and their attitude towards the brand. With regard to aspects that can alter consumers' perceptions or actions, Suh and Lee (2005) indicate that information that is presented in a rich and interactive format can improve consumer learning and persuasion, or the process in which changes to one's memory or behaviors occur. Therefore, we expect the interactive nature of a 3DVW environment to facilitate consumers' learning about a brand independent of any flow experience, thus increasing brand equity.

H3: The 3D virtual world environment will lead to a higher level of brand equity than the 2D virtual environment.

Use Intention

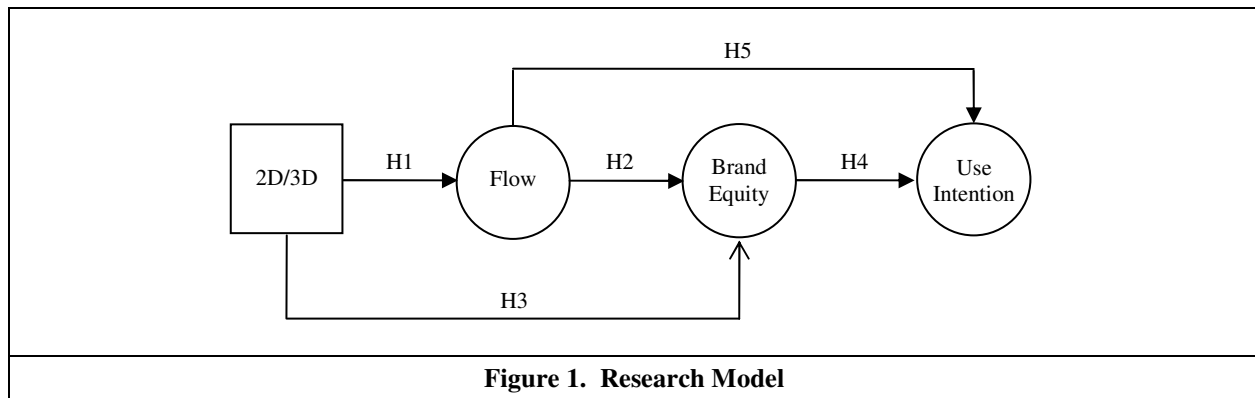
Brand equity theory posits that brand equity affects differential response and brand choice. Previous research has demonstrated brand equity's relationship with intentions to engage with an organization. Allen et al. (2007) applied brand equity theory to the context of web-based recruitment and found that an organization's image (viewed as evaluations of an organization) is positively related to one's attitudes towards an organization and indirectly related to intentions to pursue employment, along with attitudes towards a web site and organizational information. In a service-industry context, Taylor et al. (2007) found that brand equity influenced brand loyalty intentions indirectly through customer satisfaction. McDowell and Sutherland (2000), who also applied brand equity theory in the context of TV audiences, found that higher levels of brand equity lead to greater viewer loyalty as well as attraction of new viewers. Hence, we hypothesize that brand equity can have a positive impact on behavioral intention.

H4: Brand equity has a positive impact on use intention.

Various researchers have demonstrated a relationship between flow and behavioral intentions (Agarwal and Karahanna 2000; Hsu and Lu 2004; Koufaris 2002; Luna et al. 2002; Luna et al. 2003; Siekpe 2005). Suh and Lee (2005) have demonstrated that virtual reality not only improved consumer learning but also increased purchase intentions, and suggested that these effects took place through telepresence. Gupta and Kim (2007) found that pleasure or enjoyment in online experiences influenced online repurchase intentions. Similarly, Mummalaneni (2005) found that consumer satisfaction and number of items purchased were influenced by pleasure experienced during the on-line customer visit. Hence, we hypothesize that flow can influence use intention.

H5: Flow has a positive impact on use intention.

Figure 1 is the research model based on the hypotheses above.



Methodology

An experiment was used to study the effect of 2D versus 3DVW environment on flow experiences of potential c and the impact on brand equity and use intention. After a comprehensive review and thorough search in one of the leading 3DVWs, Second Life, we identified a branding site that fit this research. The site hosts a virtual hospital that is a replication of a future, real-world hospital. The site offers a 3DVW tour of this hospital and provides visitors the opportunity to enjoy a tour that combines video, scripting, and architectural innovation. The reasons for choosing this site are: (i) it is one of the most technologically advanced branding sites in Second Life, (ii) branding is the main purpose of this site, and (iii) the tour involves highly structured activities, thus ensuring that all subjects experienced the same script during the tour which enhances experimental control. Because the tour involves a series of rooms (i.e., patient room, procedure/operating room) and each of these rooms allows only one avatar or subject at a time, we needed to schedule each subject individually. Each tour took approximately 20 minutes to complete and we scheduled subjects apart at 5-10 minutes intervals.

In order to provide a 2D version of the tour that has informational equivalence to the 3D tour, we captured snapshots of the entire 3D tour as well as the audio clips associated with each of these snapshots to produce a user-controlled, audio slideshow. Subjects in both conditions followed the same script throughout the tour. In the 3D version, subjects navigated in a 3D virtual space by following the standard script. In the 2D version, subjects navigated using two buttons: The left button, “Go back,” to go back one screen, and the right button, “Continue the tour,” to proceed to the next screen. Informational equivalence was ensured in both the 2D and 3D conditions.

Research Procedures

The study was conducted in computer labs. First, the subjects were asked to fill out a pre-study questionnaire to capture their demographic information. Next, they were given a short training session on the virtual tour environment they were assigned to. For the 2D version, subjects were asked to navigate the virtual tour using the “Go back” and “Continue tour” buttons. For the 3D version, subjects were introduced to basic movements and navigation actions (e.g., clicking on objects with mouse) in Second Life. After the training session, they were then asked to complete a tour or walkthrough of the virtual hospital and its facilities. During the tour, subjects’ avatars wore RFID-enabled bracelets, which were given to them upon entering the hospital. The bracelets simulate the tracking of patients at the hospital and allow the avatars to visit appropriate areas of the hospital facilities. During the tour, the subjects wore headsets to experience multimedia content throughout the tour. After completing the tour, subjects filled out the post-study questionnaire regarding their experiences.

Measurement

The variables in our research model – flow, brand equity, and use intention (or more specifically, intention to visit the real world hospital site) – were captured in the post-study questionnaire using 19 items adapted from existing literature (see Table 2 for the sources). As mentioned earlier, we adapted Skadberg and Kimmel’s recommendation to measure flow using telepresence, time distortion, and enjoyment. In addition, we included focused immersion. All items were assessed on a 7-point Likert scale, with 1 being Strongly Disagree and 7 being Strongly Agree.

Table 2. Sources of Measurement

Construct	Source	# of Items
Telepresence	Kim and Biocca (1997), Klein (2003)	4
Time Distortion / Temporal Dissociation	Agarwal and Karahanna (2000)	2
Enjoyment	Agarwal and Karahanna (2000), Koufaris (2002)	4
Focused Immersion	Agarwal and Karahanna (2000)	3
Brand equity	Aaker (1996), Yoo and Donthu (2001)	3
Use Intention (or intention to visit physical site)	Jiang and Benbasat (2004), Koufaris (2002)	3

Data Analysis

The sample size for the study is 445. The data was collected from Jan'08-Mar'09 with business undergraduate students who were taking MIS classes. 271 subjects were in the 3D version and 174 subjects were in the 2D version. 61% of the subjects are male, and more than 90% of the subjects are below 25 years old.

Factor analysis was performed on the items for telepresence (TP), time distortion (TD), enjoyment (ENJ), focused immersion (FI), brand equity (BE), and use intention (INT). As mentioned above, previous research has not provided consistent support for the appropriate inclusion/exclusion of dimensions of flow. As shown in Table 3, TD items load onto both TP and ENJ, whereas FI items load mainly onto TP or both TP and ENJ. Hence, factor analysis suggests that telepresence and enjoyment are two distinct dimensions that are adequate to capture these four flow variables. As shown in Table 4, items for TP, ENJ, BE, and INT load on the same number of factors as when TD and FI items were included. These four factors – TP, ENJ, BE and INT – account for 82% of the variance in the data. Cronbach's alpha coefficients are 0.88 for TP, 0.93 for ENJ, 0.91 for BE, and 0.94 for INT.

Table 3. Initial Loadings and Cross-Loadings of Measures				
Item	TP	ENJ	INT	BE
TP1	.856	.139	.109	.124
TP2	.817	.149	.239	.166
TP3	.736	.170	.189	.163
FI1	.736	.372	.081	.185
TD1	.688	.414	.127	.115
TP4	.649	.244	.199	.215
FI2	.601	.379	.070	-.029
TD2	.572	.516	.125	.132
FI3	.505	.451	.137	.017
ENJ1	.292	.825	.261	.182
ENJ2	.261	.812	.133	.113
ENJ3	.293	.792	.152	.163
ENJ4	.361	.783	.278	.195
INT1	.180	.180	.903	.203
INT2	.223	.213	.875	.237
INT3	.204	.228	.855	.165
BE1	.130	.133	.164	.907
BE2	.164	.122	.200	.874
BE3	.184	.173	.179	.829

* Principal components analysis with Varimax rotation and Kaiser normalization

Table 4. Final Loadings and Cross-Loadings of Measures				
Item	ENJ	TP	INT	BE
ENJ1	.856	.259	.253	.163
ENJ2	.834	.224	.128	.107
ENJ3	.823	.252	.143	.151
ENJ4	.812	.318	.280	.181
TP1	.215	.859	.103	.109
TP2	.218	.829	.219	.149
TP3	.243	.777	.165	.136
TP4	.313	.703	.163	.185
INT1	.182	.175	.904	.207
INT2	.223	.213	.876	.237
INT3	.237	.183	.858	.165
BE1	.138	.126	.170	.908
BE2	.131	.158	.197	.875
BE3	.183	.181	.182	.826

* Principal components analysis with Varimax rotation and Kaiser normalization

The aggregate means and standard deviations of the variables are presented in Table 5. Convergent and discriminant validity tests were carried out. A general rule used in PLS and SEM (e.g., Hulland, 1999) states that in the SEM model, the loading of each indicator on its construct should have a path weight of at least 0.7. The weights in our measurement model range from 0.75 to 0.96. The smallest average variance extracted (AVE) is 0.65 which is above 0.5 recommended by Fornell and Larcker (1981). The square root of the AVE for each construct is also greater than that construct's correlations with the other constructs. Hence, the data has good convergent and discriminant validity.

Table 5. Descriptive Statistics						
Item	Aggregate Data		2D Condition		3D Condition	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Use Intention	4.30	1.56	4.08	1.56	4.46	1.55
Telepresence	3.46	1.40	3.10	1.38	3.68	1.37
Enjoyment	4.65	1.27	4.18	1.32	4.94	1.14
Brand Equity	4.33	1.24	4.28	1.15	4.37	1.29

Since factor analysis shows that telepresence and enjoyment are two independent and distinct constructs, and telepresence is media-induced (i.e., an outcome of 2D/3D media) (Steuer 1992) whereas enjoyment is a hedonic outcome that emerges from the dynamics of the flow experience (Czikszenmihalyi 1975, 1997; Czikszenmihalyi and Czikszenmihalyi 1988), the original research model was modified to show the casual relationship between these two constructs. Figure 2 shows the revised research model and the results of covariance-based SEM analysis.

For the model in Figure 2, the chi-square is 184 and the degree of freedom is 82. Due to the large sample size, the chi-square statistic is significant, but the value of the chi-square statistic divided by the degrees of freedom is 2.47, which is well below the value of 5 that researchers use as a guideline (Kline 2005). The CFI of 0.98 and TLI of 0.97 are both above the recommended value of 0.90 (Kline 2005; Bentler 1990). The RMSEA of 0.05 is within the strictest recommended value of 0.05, even though any value below 0.08 is acceptable (Browne and Cudeck 1993). The SRMR of 0.04 is also below the recommended value of 0.05. Hence, a good model fit is achieved.

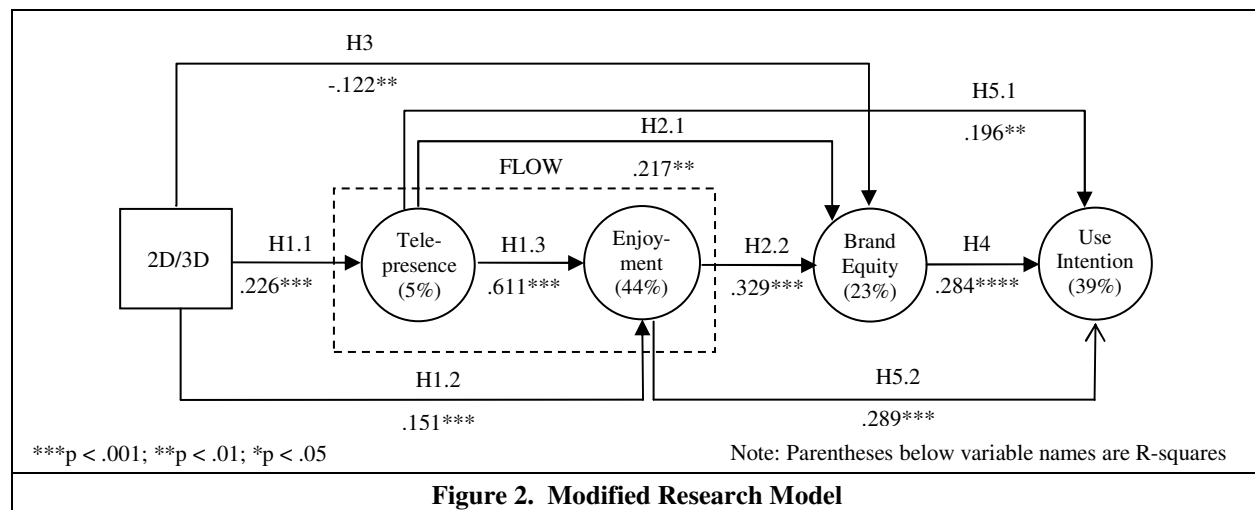


Figure 2. Modified Research Model

Secondary Analysis

Note that we did not hypothesize a path from 2D/3D to Use Intention because our theoretical foundation suggests that this relationship is mediated through flow and brand equity. We, therefore, carried out a secondary analysis to confirm that this relationship is indeed fully mediated by looking at the model fit indices with this path included.

The addition of the path from 2D/3D to Use Intention shows that this path is not significant ($p = .545$) and the model fit statistics remained the same (when rounded to two decimal places). A chi-square difference test did not show any difference between the two models (i.e., base model and the model with this path included). Hence, the model without the added path (Figure 2) presents a better model fit for the data. This analysis also confirms that there is no direct effect of 2D/3D media on use intention, i.e., the observed effect is mediated by telepresence, enjoyment, and brand equity.

Discussion

The findings suggest that the 3DVW environment induces a greater sense of telepresence and enjoyment than the 2D virtual environment. Consistent with the theory of flow in which greater immersion or telepresence can produce hedonic outcomes as well as influence learning and attitudes, we also find that sense of telepresence in a 3DVW branding site positively influences both enjoyment and brand equity. In addition, telepresence has a direct impact on use intention due to the enhanced virtual product experience. Enjoyment that is experienced with a branding site increases both brand equity and use intention. In turn, a higher perceived brand equity also increases use intention, which is congruous with the predictions of brand equity theory and previous brand equity research in which individuals prefer to be associated with strong branded services which can influence intention to use these services. Despite the strong positive indirect effect of the 3DVW environment on brand equity that is mediated by telepresence and enjoyment, we found, to our surprise, that the 3DVW environment also has a negative direct effect on brand equity.

Therefore, the findings suggest that there are two counteracting or opposing forces taking place when shifting a branding site from the 2D to the 3DVW environment. On the one hand, the 3DVW environment has a greater potential than the 2D environment to enhance brand equity through the sense of telepresence and enjoyment that are realized in the 3DVW environment. On the other hand, there is a negative effect of the 3DVW environment on brand equity. Both of these findings will be discussed further below.

3DVWs can produce the sensation of being “there” or in a computer-generated world and afford this sense of immersion even more so than the 2D environment, which is consistent with previous research findings (Coyle and Thorson 2001; Klein 2003). The 3DVW environment can offer an experience that is more enjoyable than in the 2D environment, both by inducing the sensation of being in the computer world as well as by the nature of the 3D environment itself. Consistent with Csikszentmihalyi (1975) and Chen (2006), the flow experience that was created by telepresence produced the hedonic outcome of an enjoyable experience. As suggested by our findings indicating

that telepresence positively influences enjoyment, once an individual experiences flow by feeling “in” the virtual world, they find the experience intrinsically rewarding. In addition, individuals may perceive the interactive experience in 3DVWs as fun and interesting. Consistent with Pace’s (2004) findings, individuals found enjoyment in discovery and, in this context, in experiencing the rich and highly stimulating environment. Therefore, 3DVW environments produce heightened levels of enjoyment both directly and indirectly through telepresence.

Providing an experience that is fun and enjoyable using 3DVWs can improve one’s perceived value of a brand, or brand equity. Consistent with previous research findings cited earlier, the state of telepresence can directly improve one’s knowledge about a brand. However, this state of flow can also influence brand image through positive feelings that are generated (Drenger et al., 2008). For this study, we find that telepresence both directly and indirectly (i.e., through enjoyment) enhances brand equity.

Brand equity can then prompt individuals to want or intend to use a brand, thus increasing use intention. Therefore, once individuals find value in a brand, they want to be associated with it as proposed by brand equity theory (Keller 1993). The enhanced virtual product experience resulting from the higher sense of telepresence in a 3DVW environment further enhances the effect on use intention. Suh and Lee (2005) found virtual reality or 3D environments to increase product purchase intention, but they did not test if this is a direct effect or an indirect effect through telepresence. In our research, we show that the effect on use intention is fully mediated through telepresence. In other words, the increased use intention arising from 3DVW experience over 2D experience occurs due to the higher telepresence (or enhanced virtual product experience) in the 3DVW environment. In addition, the enjoyment that individuals experience in the 3DVW environment can provide enticements to use those products or services associated with the brand, both directly and through brand equity. Similar to previous research findings (Koufaris 2002; Kim 2007; Mummalaeni 2005), individuals who encounter a pleasurable experience on a branding site have intentions to use the brand or patronize its business in the future.

However, as noted above, the 3DVW environment also induces a negative effect on brand equity, which is contrary to the hypothesis. This is an interesting and unexpected finding that can be explained using the distraction-conflict theory (Baron 1986). On the one hand, the 3DVW environment is immersive, fun, and interesting, which can enhance users’ learning and strengthen the impact of their exposure to the brand. On the other hand, having to navigate and interact in a 3DVW site can be a distraction to the subjects in attending to the audio and visual information on the site. The latter phenomenon can be explained using distraction-conflict theory.

Distraction-conflict theory, as proposed by Baron (1986), proposes that when a person experiences conflicts between focusing attention on a task versus focusing attention on a distractor, he or she may experience cognitive load problems which result in attentional focusing (Muller et al. 2004). Attentional focusing entails an individual narrowing his or her attention to just a central set of cues while ignoring peripheral cues that may be present. If a task only requires a central set of cues to perform effectively, then task performance can still be effective. However, if a peripheral set of cues is necessary for task performance, then performance may be problematic. Although distraction-conflict theory has been applied previously to explain how the co-presence of others can be a distraction that creates attentional conflict, Nicholson et al.’s (2005) preliminary work suggests that other types of distractions, such as the world news being played in the background while one tries to complete a complex task, can also inhibit performance.

In the context of our study, the richness and variety of attentional (e.g., audio, visual, and video) cues available in the 3DVW environment may serve as a distractor to the subjects from focusing their attention on the brand information in the environment. This phenomenon was also noted by Steuer (1992) where he discussed mitigating factors. He cited McLuhan (1964) who indicated that an extremely “hot” (or “rich”) medium may actually interfere with users’ ability to carry out interactions mindfully in real-time. Steuer (1992) offered the same explanation as distraction-conflict theory, noting that the limitations of human’s cognitive information processing power may serve as a bottleneck in online environments that are highly interactive (e.g., high-bandwidth) and vivid (e.g., relating to multi-sensory experiences). Individuals who were in the 3DVW environment may have initially experienced attentional conflict by trying to explore the interactive capabilities of the environment itself (e.g., exploring the lobby or patient room in the virtual hospital might have become the subjects’ central cue set) while trying to listen to the information that was being presented (e.g., listening to the audio message presented at the front desk or through a teleconference monitor on brand information became the subjects’ peripheral cue set).

Therefore, the ability to explore and perform other activities in the 3DVW environment may have presented an initial distraction to the subjects who were then unable to attend to central cues to learn about the brand. Some of the comments provided by our subjects after the experiment validate the above explanations. Their comments

suggested that they were interested in exploring the environment that they sometimes lost track of listening attentively to the audio presentation or attending to the video presentation that accompanied the audio presentation. Hence, distraction-conflict theory suggests that businesses may face a paradox when implementing branding sites on 3DVWs. The challenge in such implementations is in minimizing the distractors and maximizing the telepresence and enjoyment components of the user experience to yield overall positive outcomes to brand equity.

Limitations and Future Research

There are a number of limitations in this research. First, undergraduate college students participated in this study. Hence, caution is needed in generalizing the findings from this study to other populations. Second, most of the students do not have much experience with 3DVWs. Only about 10% of them have more than five years of experience with the 3DVW environment. We ran the data analysis with and without the subjects with experience in virtual worlds and found the results to be consistent. We acknowledge, however, that due to the limited experience of the majority of the subjects with virtual worlds, our results may not be generalizable to users who are familiar and experienced with virtual worlds. Future research may compare the effects of 2D versus 3DVW environments with experienced users of 3DVWs. Third, this research study was conducted in only one virtual world environment (i.e., Second Life) with a specific branding site that pertained only to a virtual tour of a hospital. Further research is needed to determine the applicability of the findings to other types of services and products and in other 3DVW environments.

This research opens up many other questions for investigation. First, considering the flexibility of new modes of advertising and the potential reach to customers, Barnes (2007) indicates that advertising in-worlds, such as Second Life, need further scrutiny to understand the impact on purchasing intentions. Issues such as security, privacy, trust, and the value of virtual currency also need to be studied if consumers are interested in doing commerce within a 3DVW. In addition, owners of the sites need to engage the visitors or customers by providing lots of hands-on objects or activities to enhance its interactivity and a community of interested parties to maintain the social components on the site. Hence, increasing the participation and maintaining the interests of consumers are important and related research questions.

Second, future research can extend our model by looking at other factors such as specific aspects of affordances in the environment (e.g., use of haptic feedback, use of text versus audio), media characteristics (e.g., vividness, interactivity), and usability issues (e.g., mechanisms or actions to carry out 3D navigation) to further enhance brand equity through telepresence and enjoyment, and minimize the distracting effect or factors. In addition, our research model provides guidance for future research that focuses on the telepresence experience that 3DVWs afford. Therefore, additional research can test the applicability of the telepresence experience in 3DVWs in other contexts, such as education, and the benefits that can be derived. Future research also needs to test the generalizability of the model in this research to other virtual world or virtual community environments, to other online contexts (e.g., engaging in different types of Internet use), and to other types of users.

Additional research is also needed to more fully understand the flow phenomenon in different online environments. In this research, we use Skadberg and Kimmel's (2004) recommendation for operationalizing flow. It is possible that other operationalizations of flow may derive slightly different results. In future research, we are interested in assessing different measures of flow and how different online contexts may moderate the flow experience.

Lastly, several other researchers also propose very important issues to study in the 3DVW environment. Since the 3DVW environment provides many unique features that are worthy of further investigation, research to understand the opportunities and specific nuances that need to be considered to be successful in business ventures are warranted. Campbell et al. (2007) have proposed to study the social factors of trust and conflict which may impact the ability of virtual ecosystems to thrive. Lui et al. (2007) suggest that research should evaluate product attributes that are most conducive to 3DVW environments considering that some products require certain senses to experience that are not available in a digital form (e.g., taste, smell), whereas others (those requiring visual, audio, or both to perceive or understand the products/services) are more likely to be enriched in an online environment. Considering the flexibility of new modes of advertising and the potential reach to customers, Kahai et al. (2007) propose to study the effect of the unique features of 3DVWs and various leadership styles on virtual team collaboration. In our current research stream, we assess the unique or specific aspects of engaging users of 3DVWs in the flow experience and its resultant effect on brand equity.

Conclusion

Although Csikszentmihalyi (1975, 1991, 1993, 1998) does not address telepresence directly, several researchers (e.g., Hoffman and Novak 1996; Novak et al. 2000; Skadberg and Kimmel 2004; Chen et al. 2000; Shin 2006) have examined telepresence in the context of flow. As evident from our findings and the work of other researchers such as Skadberg and Kimmel (2004) and Chen (2006), telepresence is a very important dimension of the flow experience in the online environment. Subjects who experienced telepresence also attained a higher level of enjoyment from the online experience.

From a theoretical perspective, it is essential to include telepresence when studying 3D virtual environment (Klein 2003; Steuer 1992). We have established the importance of examining enjoyment as a hedonic outcome of telepresence and study the effect of telepresence and enjoyment on business-related outcomes, which are brand equity and behavioral intention in this study. Specifically, we want to highlight the importance of including mediating factors such as telepresence and enjoyment to fully understand the impact of 2D versus 3D environment. For example, our study identifies both positive and negative effects of 2D versus 3D environment on brand equity. The positive effect takes place through telepresence and enjoyment, while the negative effect takes place because of split attention experienced by users when dealing with a rich and interactive medium. Hence, both the flow theory and the distraction-conflict theory come into action at the same time. This presents cautions that need to be taken and a potential paradox to organizations in their design and implementation of 3DVW sites. We propose that there is a need to balance both the flow/enjoyment components and the distraction effects that may result (due to the limited cognitive resources or information processing capabilities of users).

In conclusion, 3DVW environments provide new opportunities to engage users in telepresence experiences and enhance brand equity, but also present unique aspects for further research and practical considerations. Our research study uses the theories of flow and brand equity to assess the differences in user experiences and perceptions in 2D versus 3DVW environment. Organizations will benefit from this research by developing their 3DVW sites and the activities within these sites around these factors to engage visitors' experiences through sense of telepresence and provide enjoyable outcomes, while avoiding the "overkilling" effects of media richness due to limitations in human information processing capability.

Future research will also benefit from the theoretical framework in this research to understand the telepresence phenomenon in 3DVW environments and its effects on hedonic experiences and consumer perceptions and (intended) behaviors. Overall, 3DVW environments present new customer touch points that may prove to be one of the most engaging. Hence, such 3DVW environments provide significant potential to enhance perceived brand equity and appeal in the minds of customers.

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